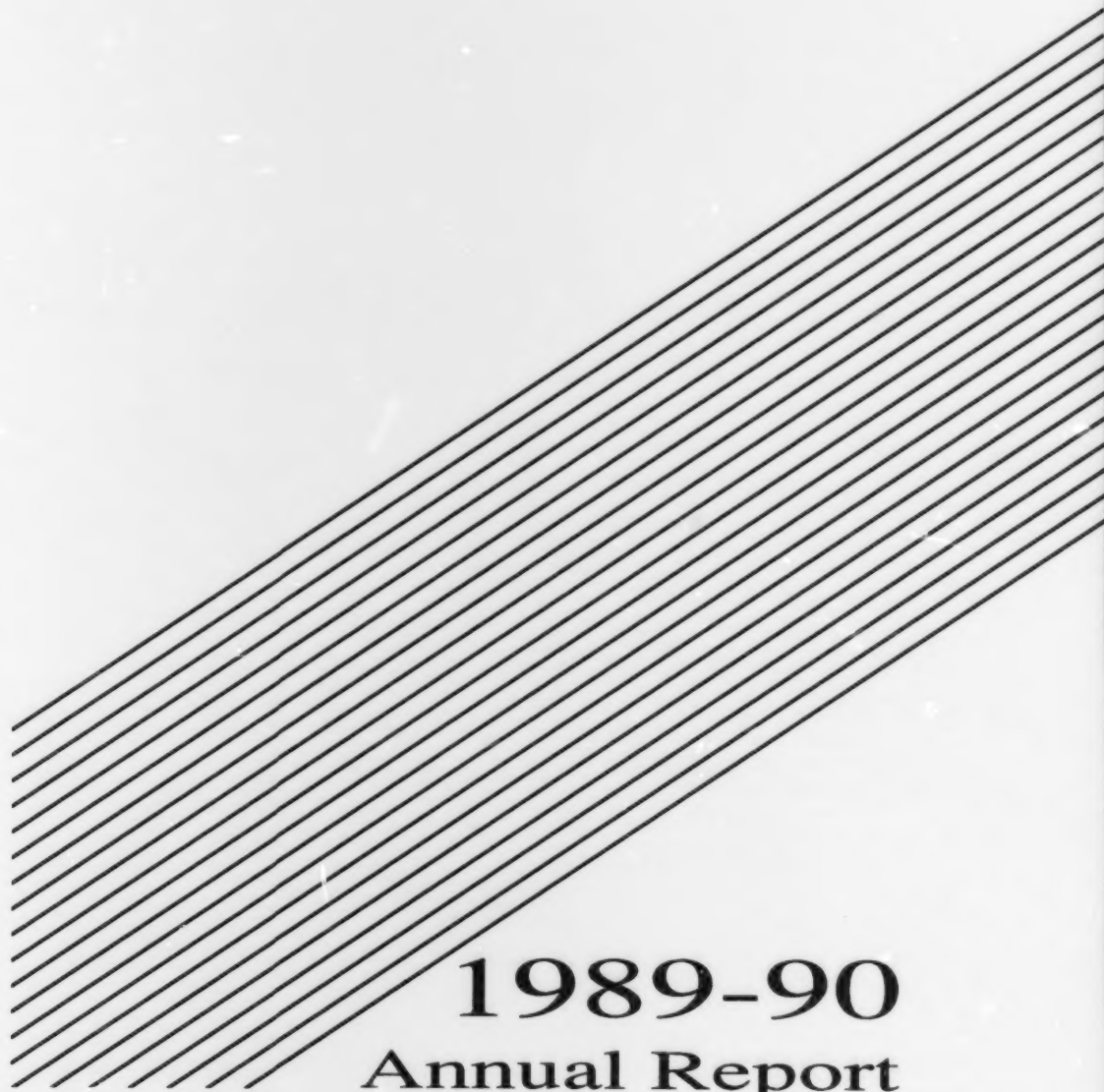


91-04975/

Alberta Technology, Research and Telecommunications



1989-90
Annual Report



TECHNOLOGY, RESEARCH
AND TELECOMMUNICATIONS

Office of the Minister

403 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/422-5982 Fax 403/422-6040

The Honourable Dr. David J. Carter
Speaker of the Legislative Assembly of Alberta
325 Legislature Building
Edmonton, Alberta
T5K 2B6

Dear Sir:

I have the honour to submit the Annual Report for the Department of Technology, Research and Telecommunications for the year ending March 31, 1990.

Respectfully submitted,

A handwritten signature in cursive script, reading "Fred A. Stewart".

Fred A. Stewart
Minister



TECHNOLOGY, RESEARCH
AND TELECOMMUNICATIONS

Office of the Deputy Minister

12th Floor, Pacific Plaza, 10909 Jasper Avenue, Edmonton, Alberta T5J 3M8 403/422-0567 Direct Line 403/422-006
Telefax 403/420-1474 Telex 037-4268

The Honourable Fred A. Stewart
Minister of Technology, Research and Telecommunications
403 Legislature Building
Edmonton, Alberta
T5K 2B6

Dear Mr. Stewart:

I have the honour to submit a report covering the activities of the Department of Technology, Research and Telecommunications for the fiscal year ending March 31, 1990.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Ken H. G. Broadfoot".

Ken H. G. Broadfoot
Deputy Minister

Minister's Message

Competing in the global marketplace

In its fourth year of operation the Department of Technology, Research and Telecommunications continued its commitment to economic diversification through the growth of Alberta's advanced technology community. Over the past decade, significant strides have been made in establishing and nurturing a viable advanced technology sector.

The 1980s saw the emergence of a highly-competitive global marketplace, driven by research, innovation and the manufacture of value-added goods. To maintain Alberta's superior standard of living, it is imperative to participate and successfully compete in that marketplace.

Through co-operation and collaboration with the province's universities, the private sector and the Alberta Research Council, the Alberta Government has identified new opportunities and pursued the research, development and commercialization of various types of technologies.

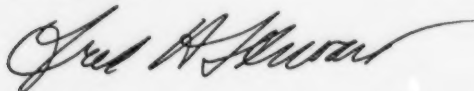
In addition, Alberta's sophisticated network of research and development organizations, which includes the Alberta Heritage Foundation for Medical Research, the Alberta Microelectronic Centre, the Electronics Test Centre, the Biotechnology Pilot Plant at the Alberta Research Council, the Alberta Telecommunications Research Centre, The LASER Institute and others, provides the province with distinct advantages.

Over the past year, the Department embarked on many important new initiatives. In co-operation with three western provincial governments and four leading space technology companies, an ambitious proposal entitled the Earth Environment Space Initiative (EESI) was developed that will allow environmental management from space using advanced technology to monitor air, water and land quality. Negotiations were initiated on international technology acquisition arrangements with Belgium and Hungary. SRI International was selected to perform an evaluation of Alberta's advanced technology centres. A new Medical Devices Section was created in recognition of the diversity of applications which underlie the economic potential of the medical products industry. And much more.

Telecommunications policy continued to receive considerable attention, and the Government of Alberta has increased its efforts to ensure the telecommunications industry in the province, and in particular Alberta Government Telephones, is prepared for the competitive advanced technology and global telecommunications marketplace of the 1990s.

The Department also continued its public awareness program stressing the importance of advanced technologies to the day-to-day lives of all Albertans.

Alberta must continue to build on its inherent strengths and be alert to the new opportunities and challenges of the coming decade and beyond. With the continued support and co-operation of our advanced technology partners in the private and public sectors, I am confident that those opportunities will create continuing success for Albertans.



Fred A. Stewart
Minister

Mission Statement

The Department will promote the research, development and commercialization of science and technology, the application of new technology to existing and new industries, and the creation of new employment opportunities arising out of technology development within Alberta. It will ensure that public policy supports a high quality, affordable communications system for all Albertans, and work to create an awareness and understanding among Albertans of the economic, social and environmental benefits of advanced technologies.

The Minister is responsible to the Legislature for :

- the Alberta Research Council;
- Alberta Government Telephones;
- Alberta Educational Communications Corporation (ACCESS NETWORK); and
- the Alberta Heritage Foundation for Medical Research;

and liaises with the:

- Alberta Oil Sands Technology and Research Authority;
- Alberta Environmental Centre;
- Agricultural Research Council of Alberta;
- Alberta Foundation for Nursing Research; and

other provincial organizations undertaking research in the engineering, medical and natural sciences fields.

Department Goals

The goals of the Department are to:

- expand and diversify the Alberta economy through the development and application of advanced technology in both traditional and new non-resource based industries;
- provide opportunities for future Albertans in skilled technology industries which are competitive on a world-wide basis;
- encourage a technology culture within the province which prompts broad participation by Albertans in the research, development, commercialization and utilization of advanced technologies;
- establishment of an environment and infrastructure that will enable rapid development and deployment of technology, whether developed here or elsewhere;
- maximize the commercialization of research and development in Alberta;
- make Alberta an important centre for industry-led research and development in priority areas;
- emphasize priority advanced technology areas in conjunction with other provincial agencies, government jurisdictions, research institutes and industry to create co-operative initiatives aimed at exploiting the commercial benefits of technology development; and
- establish linkages that enable meaningful co-operation on advanced technology development between industry, universities, and government.

Department Strategies

The broad strategies of the Department include:

- developing "home grown" technology-intensive companies through the provision of start-up assistance, management and marketing support;
- identifying and establishing a "building block" infrastructure which will bridge the research interests of business, research institutions and universities;
- stimulating the commercialization of research and development through co-operative arrangements and programs applicable to business, universities, the general public and government laboratories;
- developing pathways for the transfer of technology into Alberta for use by companies and institutions;
- encouraging the application of technology to traditional industries to enable them to become more competitive and productive;
- working closely with the federal government in science and technology areas, with particular emphasis on obtaining an equitable share of federal science and technology expenditures;
- developing human resources in conjunction with appropriate agencies to ensure that the Province can meet the human resources requirements for advanced technology development, and that Alberta companies have access to technologists;
- improving the availability of risk capital;
- attracting investment by international technology companies which will result in significant projects in our priority development areas;
- establishing a communications program to build public understanding of Alberta's technology development opportunities and scientific achievements.

Technology Commercialization Division

The Department has identified a number of advanced technology sectors in which Alberta may be competitive on a worldwide basis. These are:

- electronics and microelectronics;
- computers and software;
- telecommunications;
- medical and biological services;
- advanced materials and processes; and
- advanced manufacturing technologies.

The Technology Commercialization Division is responsible for promoting these areas and assisting Alberta companies to develop new and innovative products which have local and international market potential.

The Division administers a \$2.5 million Commercialization of Technology Program which provides financial assistance to private sector requests for the support of institutes, development of new products, commercialization of research, and feasibility studies. The program assisted 34 organizations with a total commitment of over \$ 2.4 million for the fiscal year.

Electronics/Microelectronics

The Electronics/Microelectronics Section is responsible for assisting Alberta industry in incorporating and developing new electronics and microelectronics products. The industry is well supported by Alberta's advanced technology infrastructure which includes "building block" facilities such as the Electronics Test Centre, the Alberta Microelectronic Centre and The LASER Institute.

During the past year, this section has been actively involved in the development of new microelectronic opportunities. In addition, this section has become involved with the application and commercialization of remote sensing and biometrics technology.

Other initiatives of the past year include the selection of SRI International to perform an evaluation of Alberta's advanced electronics technology centres.

This study will address such issues as: training, academic leverage, industrial research, technology transfer, and economic diversification.

Telecommunications

The telecommunications industry is a strategically important area for economic growth and diversification. Alberta has a mature telecommunications infrastructure and an internationally recognized industry at the forefront of technology.

The Telecommunications Section is responsible for the attraction of new companies providing telecommunications services and products, and for the promotion of strategic alliances with new and existing companies. This section is also constantly reinforcing Alberta's commitment to existing companies.

Initiatives in the past year have concentrated on fulfilling these responsibilities as well as assisting in obtaining future federal funding for the Calgary facilities of the Alberta Telecommunications Research Centre. Considerable activity took place regarding the federal Tactical Command, Control and Communication System (TCCCS) Iris Project. This section assisted in identifying and securing Alberta sub-contractors and suppliers

Medical and Biological Sciences

The Medical and Biological Sciences Section assists with the development and commercialization of technologies that generate human and animal health care products (drugs, vaccines, diagnostic agents) and agents used in new chemical, waste treatment, food processing and agricultural products. Biotechnology is a major stream of technology development within biomedical sciences.

The Department funds the Medical Innovation Program to assist individuals and companies commercialize technologies in this area. The fund is administered by the Alberta Heritage Foundation for Medical Research.

Medical Devices

This new section was created in February 1989 in recognition of the diversity of applications which underlie the economic potential of the medical products industry.

The introduction of technological innovations in the conventional medical industry will create economic opportunities for new companies affecting a broader range of industries including electronics, computers, telecommunications, advanced materials and so on.

The Medical Devices Section assists with the development and commercialization of health care products used for diagnostic or therapeutic purposes which include products and equipment specifically designed for hospitals, nursing homes and home health care applications.

Initiatives of the past year include assisting companies in commercializing new technologies using the Department's Technology Commercialization Program and the newly created Medical Innovation Program administered by the Alberta Heritage Foundation for Medical Research.

As well, the section participated in the Industry, Science and Technology Canada campaign on medical devices, taking part in the working group on science and technology.

The benefits of this sector campaign to Alberta will be a strategic plan to strengthen and further develop the medical devices industry.

Information Technologies

The Information Technologies Section is responsible for assisting Alberta's Information Technologies industry develop and commercialize new products. Developments of importance include high performance computers, engineering workstations and related applications software, often involving artificial intelligence, expert systems, computer-aided design, drafting and engineering.

This section also co-operates with computing sector associations, including the Alberta Society of Software Developers, Canadian Information Processing Society, the Edmonton and Calgary Advanced Technology Associations, Alberta Chapter

of Canadian Advanced Technology Association, Information Technology Association of Canada, the Canadian Association of Data Processing Service Organizations, and the Alberta Courseware Producers Association.

The section successfully co-sponsored the CIPS '89 Congress in Edmonton as well as the Federal-Provincial Software Industry Liaison Committee.

Other activities of the section included: initiating the Software Industry survey with the corporate responses to be profiled in a future Products and Capabilities Directory; organizing and co-ordinating the Ministerial External Advisory Committee for the Software Industry with executives from the private sector; beginning an infrastructure assessment for the province's Information Technology sector; participating in the interdepartmental Software Industry Support Committee; and arranging and hosting several visiting Information Technology companies on technology tours of Alberta.

Advanced Materials and Processes

Alberta has a long tradition as a supplier of materials and products to the world from its traditional resource, manufacturing and processing industries. In keeping with this tradition, an advanced industrial materials sector is being developed as "new" materials replace "old" materials in developing world markets.

Furthermore, since materials form the basis for all products, advanced industrial materials and processes offer a technological lead for our new emerging industries in areas such as telecommunications, medical devices and microelectronics. Manufacturing efficiency advantages are also offered to our traditional industries.

Companies such as Sherritt Gordon, EDO Canada, Ampitech, and Advanced Technology Plastics form the backbone of the sector.

The \$140 million WESTAIM advanced materials project is jointly funded by Sherritt Gordon Ltd. and

its industrial allies, the Government of Canada and the Alberta Government for a period of five years. Under the agreement, which is market-driven and industry-led, industrially strategic applied research and development, crucial to Alberta's plans for diversification of the economy, will be undertaken. It is expected that Sherritt will expand substantially into the area of specialty materials and many skilled jobs will be created. In addition, new advanced materials companies will start up in the Province as a result of Sherritt's strategic alliances. Impetus will also be given to Alberta research institutes and Universities as a result of contract research arrangements. The program is presently in its formative stages.

The section is encouraging the formation of critical mass in know-how, equipment and people skills by interacting closely with the Alberta Telecommunications Research Centre, the Alberta Microelectronics Centre, the Alberta Research Council, the Centre for Frontier Engineering Research, the University of Alberta and The University of Calgary. These Alberta institutes are deeply involved with advanced industrial materials either as direct applied research agencies or materials end user groups. High technology and traditional industry companies are assisted in accessing the institutes using federal and provincial research funding programs.

The section supported a number of advanced industrial material conferences sponsored by the Canadian Advanced Industrial Materials Forum (CAIMAF) and the Canadian University Industry Council for Advanced Ceramics (CUICAC) in the past year.

Manufacturing Technologies

The primary concerns of the Manufacturing Technologies Section are: competitiveness, infrastructure and industry build-up. Increasing the international competitiveness of Alberta's existing manufacturing industries is the section's primary focus. The secondary focus is the development of the infrastructure which supports the diversification of Alberta's local manufacturing community. The third focus is attracting major companies and

supporting local companies, as both relate to the development of manufacturing equipment.

During the year, Technology, Research and Telecommunications funded Alberta Research Council manufacturing studies for Gienow Building Products Ltd. and Indepor Inc. to provide a plan on how to implement some of the numerous manufacturing technologies available.

The results are positive: Gienow has captured a larger percentage of the national residential and commercial wooden window market while winning a contract to supply the Japanese market; Indepor, a manufacturer of porcelain insulators, has discovered ways to reduce the percentage of scrap material used in the production process.

In surveying Alberta's manufacturing infrastructure it was observed that the province has no recognized formal training programs for its manufacturing professionals such as managers, engineers and technologists. To address this deficiency, the Department will support the Society of Manufacturing Engineers, assist The University of Calgary in developing its Manufacturing Engineering Degree Programs, and co-sponsor Alberta's first major manufacturing conference, held in November 1989.

The Department continues to look at those technology commercialization projects where high technology solutions are proposed to resolve existing manufacturing problems. For example, funding was provided for the development of a machine vision system for the inspection of impurities in the manufacturing of pulp. The Department was also supportive of a machine vision system for the inspection and grading of lumber. A proposal was received to develop an irradiation process for the treating of cattle hides - which would eliminate the environmentally inferior salt water treatment method.

The section also focuses on the development of research parks and administers the Department's Technology Commercialization Program, which provides financial support to numerous advanced technology initiatives in the province.

The section undertook a number of research park - related initiatives in the 1989/90 year including the official opening of a multi-tenant research facility in Calgary's University Research Park. Funding for this facility was provided by the Alberta Government and the City of Calgary.

As well, the section worked with three other western provincial governments and four leading space technology companies to develop a proposal entitled the Earth Environment Space Initiative. This project involves the monitoring of environmental conditions from space, utilizing Western Canadian capabilities. The project definition phase of this initiative received approval from the Canada Space Agency, and other federal funding sources during the 1989/90 year and is presently proceeding on schedule.

During the course of the year, the section also reviewed numerous proposals from the environmental industries and manufacturing industries sectors and assisted these companies in developing business plans and seeking financing.

Technology Transfer

Technology Transfer finds ways to commercialize inventions, technology know-how and technical information generated by agencies funded by the provincial government or private individuals. This includes working with technology transfer offices at the Universities of Alberta and Calgary.

This section also encourages provincially funded agencies to buy newly developed advanced technology products and processes through the First Purchase Program and encourages Alberta industries to adopt foreign technologies. The Section is also involved in importing technology inventions for use by Alberta's industries.

The initiatives of the last year included the provision of significant financial support to the technology transfer offices at the Universities of Alberta and Calgary. This led to the privatization of The University of Calgary office now called University Technologies International.

In conjunction with the Licensing Executives Society, the Alberta Research Council, and Alberta Economic Development and Trade, the section sponsored technology transfer seminars in Edmonton and Calgary oriented toward the individual inventors. Over 50 inventors were assisted during the year.

As well, the section helped stimulate the development of university industrial affiliates and encouraged the development of university spin-offs

In international technology transfer, the section initiated negotiations on technology acquisition arrangements with Belgium and Hungary.

Research and Planning Division

The Research and Planning Division provides research, advice and co-ordination in the ongoing development and administration of Alberta Government policy in both communications and science and technology.

The Division is responsible for long-term planning within the Department and assists in the development of specific sectorial plans for advanced technology industries. It also provides technical, economic, financial and policy advice to support Departmental programs and other initiatives.

In addition, the Research and Planning Division provides support to the Minister in his responsibilities for the administration of the Alberta Research Council Act, Alberta Heritage Foundation for Medical Research Act, Alberta Educational Communications Corporation Act, and the Telecommunications Act.

The Division has administrative responsibility for the delivery of several programs including the Alberta-Heilongjiang Science and Technology Exchange Program and the Individual Line Service Program.

Telecommunications Policy

The Division was instrumental in the drafting of the new Telecommunications Act, which received Royal Assent on July 6, 1988. The Act effectively consolidated a number of telecommunications-related statutes as well as clarified a number of issues relating to the operating authority of Alberta Government Telephones (AGT), and the company's working relationship with the municipally-owned and regulated "edmonton telephones".

The Division was also involved in AGT's 1986 General Rate Application before the Alberta Public Utilities Board as well as a number of ongoing federal/provincial/territorial initiatives involving the development of a national telecommunications policy.

The Supreme Court of Canada announced its decision in the *Alberta Government Telephones versus Canadian Radio-television and Telecommunications Commission (CRTC)* and

CNCP Telecommunications (CNCP) case (the AGT decision) in August 1989. The result of that decision was that the Alberta Public Utilities Board (PUB) lost the ability to regulate the operations of Alberta Government Telephones (AGT). The Telecommunications Policy Unit was active both in the preparation leading to the Supreme Court hearing as well as the analysis and management of the results of the AGT decision.

In order to ensure the continued review of AGT operations, the Department assisted in establishing the Ministerial Committee on Telecommunications (MCOT). The purpose of MCOT was to review items proposed by AGT from rate changes to services which previously would have been reviewed by the Alberta PUB. MCOT would advise the Minister on whether the proposals should be accepted, rejected or amended. The Minister would then advise AGT of his decision. Fifteen submissions were reviewed by MCOT and approved by the Minister during the fiscal year. Among those decisions was the approval for the first Call Management Services in Canada as well as 46 new Extended Flat Rate Calling (EFRC) routes. Telecommunications Policy also co-ordinated a Western Communications Ministers Meeting in September 1989, organized to discuss the implications of the AGT decision on the three Crown-owned telephone companies in Western Canada. The Unit also participated in a Federal/Provincial/Territorial Officials Meeting in December 1989 called to discuss the establishment of a new federal *Telecommunications Act*.

A Government Committee was created to examine the privatization of Alberta Government Telephones. The unit was heavily involved in the activities of the legislative and regulatory subcommittees. As well, the Unit was actively involved in the review and monitoring of the proposed federal *Broadcasting Act*. The unit jointly participated in three studies with the Governments of Manitoba and Saskatchewan aimed at assessing the impacts of competition in the provision of public long distance voice services.

Distance Education and Communication

Through its membership on the Research Advisory Board of the Canadian Distance Learning Development Centre (CDLDC), the Department assisted in developing a strategic plan for the Centre as well as evaluating research and product development proposals.

Due to more pressing financial priorities, the Alberta Government ended its involvement in the CDLDC in the spring of 1990.

The Department also participated on Alberta Education's Provincial Advisory Committee on Distance Education and the Interdepartmental Liaison Group on Library Development under the jurisdiction of Alberta Culture and Multiculturalism. The Department provided advice and co-ordination in examining the feasibility of dedicated provincial networks.

Science and Technology Policy

The federal Networks of Centres of Excellence Program got underway this past year with a few of the successful networks finalizing budgets and subsequently receiving initial funding. Alberta researchers are involved in 12 of the 15 networks participating in this program. Alberta participants are involved in areas such as biotechnology, medical/healthcare, space research, telecommunications, microelectronics and computing sciences.

The Economic Planning Cabinet Committee agreed to recommend approval to Cabinet of the request for provincial support of the Alberta participants in the Networks of Centres of Excellence Program.

The Department was involved in co-ordinating the Province's participation in a number of intergovernmental forums, including two meetings of the Western Ministers responsible for Science and Technology (February and June) and an April meeting of the Council of Science and Technology Ministers.

The Department was also responsible for the organization of the second National Forum of Science and Technology Advisory Council which took place in May.

Science and Technology Exchange Program

The Science and Technology Exchange Program has been in operation for three years. The program involves a yearly reciprocal exchange of up to 10 scientific personnel between Alberta and our sister province of Heilongjiang in the People's Republic of China. Last year, the program sponsored exchanges in the fields of remote sensing and land-related information systems, coal and hydrocarbon processing and biotechnology.

RADARSAT Project

Division personnel continued their participation in Canada's RADARSAT project. RADARSAT is a Canadian-led international joint program to design, construct and operate Canada's first earth observation satellite system. Alberta is participating in policy development and planning guidance on the domestic aspects of the program in matters relating to the acquisition, processing and distribution of the RADARSAT data. The satellite is currently in the development stage. Construction will begin in 1991 for launch in 1994.

Industry and Statistical Research

With the ongoing development of Altatech and other science and technology databases, the Division publishes information and responds to numerous inquiries from the public relating to composite indicators of technology-intensive enterprises, product array, and R&D activities. The Department co-sponsored with Statistics Canada the 1989/90 census of Provincial Government scientific activities. Time series data on investments in Alberta's R&D capabilities were provided to several public sector forces and agencies.

Individual Line Service Program

The Individual Line Service Program began in September 1987 when the first rural residents received an individual telephone line in place of a party-line, and represents the fulfillment of a commitment made by the Government to replace all multi-party lines in Alberta with individual line service.

The Program, which is scheduled for completion by June 1991, will provide more than 100,000 telephone subscribers throughout Alberta with private-line service. Over 75 per cent of the cost of individual line service is funded by the Government through the Alberta Heritage Savings Trust Fund.

As set by the Public Utilities Board, customers may choose to make a one-time payment to Alberta Government Telephones of \$560 or equivalent monthly payments of \$5. In keeping with the Government's commitment to provide this universal service at \$450, subscribers will receive a rebate of \$110.

The program also refunds monthly exchange circuit surcharges to rural customers who acquired private lines before the ILS program began.

The Department is responsible both for administering this program and for providing rebates to customers after their lines have been converted. As of March 31, 1989, 33,900 rural telephone subscribers had been converted to individual private-line service.

Trade and Economic Development Initiatives

The Division participated in a number of interdepartmental initiatives, studies and reports dealing with provincial economic diversification strategies, achievements and related issues.

In the area of trade, the Division was involved in monitoring a number of international trade developments, specifically the Uruguay Round of GATT negotiations and its possible impact on advanced technology manufacturers and service providers in the province. The Division continued to assess the implementation of the Canada-U.S. Free Trade Agreement and its impact on Alberta's

advanced technology industries. The Division was also involved in identifying ways in which industry could continue to maximize the benefits of the Agreement.

1989/90 also saw the Division becoming increasingly involved in exploring opportunities for joint federal-provincial funding of a number of advanced technology-related areas, and in other similar activities designed to increase the profile and involvement of Alberta's industry and research infrastructure in the federal government's research and industrial development activities.

Alberta Medical Innovation Program

Under the federal government's amended Patent Act, the federal government agreed to pay \$100 million to the provinces for medicine related research and development. Based on the \$9.3 million accruing to Alberta, the Department established the Alberta Medical Innovation Program (MIP). This five-year program, which is to be administered by the Alberta Heritage Foundation for Medical Research (AHFMR), was established to assist Alberta businesses and entrepreneurs in prototype development, testing, and clinical trial of promising new drugs and medical devices, and will complement the existing technology transfer initiatives of the AHFMR.

Business Development and Marketing

The prime object of the Business Development and Marketing Division is to promote and facilitate investment in Alberta's advanced technology sectors.

The Division develops and reinforces an awareness in the Canadian and international business communities of the Alberta Government's commitment to research, development and commercialization of leading-edge technologies.

It encourages investment in advanced technology development by promoting Alberta's programs, facilities and institutions.

Potential investors are identified and introduced to opportunities and prospective joint venture partners in Alberta, and the Division assists entry into the Alberta business community.

The Division returned to the eastern U.S. coast to further its exposure by participating in a major electronics show, Electro '89, held in New York City. The division was also a first time participant on the western U.S. coast at IBEX '89, a biotechnology exhibition, held in San Mateo, California.

The Division also promoted Alberta advanced technology investment opportunities by co-co-ordinating exhibitions in New Orleans, San Francisco and Toronto. Additional participation in these exhibitions came from Alberta companies, research institutions, educational institutions and municipal economic development authorities. The highlight of the year was a 16 company mission to Belgium and participation at the Flanders Technology International exhibition held in Ghent, Belgium.

International delegations from Belgium, Taiwan, West Germany and Japan visited the province and were introduced to Alberta's advanced technology infrastructure.

Finally, in support of Alberta professional and scientific organizations, the Department participated in exhibitions in Edmonton and Calgary to promote public awareness of Alberta's technological developments and accomplishments.

Financial Projects and Administration Division

Financial Projects and Administration provides analytical support, project appraisal and advice to the Department and Minister on financial aspects of projects funded by Technology, Research and Telecommunications. The Division co-ordinates the provision of legal and contract services to the Department through liaison with the Attorney General's Department, and is responsible for negotiating, drafting and processing financial agreements and contracts. It also provides administrative support, including EDP services and financial advisory services to the Department. The Division establishes and maintains accounting records and procedures and prepares the annual Departmental budget. It monitors expenditures and contracts entered into by the Department with the private sector.

Human Resources Division

The Human Resources Division develops personnel systems and programs and provides consultant services to Departmental managers and staff. These programs consist of recruitment and selections, classification and compensation, employee relations, organizational design, human resources planning and pay and benefits administration.

Corporate & Public Relations Division

Corporate and Public Relations manages the flow of information concerning the issues and activities relevant to the Department's mandate. It designs and delivers promotional materials required by other divisions of the Department, and co-ordinates information dissemination on behalf of the Minister and the Department.

Corporate and Public Relations also assists advanced technology facilities, institutions and organizations to increase the understanding of the Province's science and technology achievements and ambitions.

To help meet its goal of creating a science culture in Alberta, Corporate and Public Relations instituted planning for Alberta's first Science and Technology Week, and the first annual Alberta Science and Technology Leadership (ASTech) Awards. The Division launched the Department's Science City Campaign to raise the level of awareness of the scope and scale of science and technology in Alberta as well as continuing activity in its Student Awareness Program.

Financial Statement

Budget Estimates and Expenditures Classified by Vote, Sub-Program and Element

Vote 1	Development and Commercialization of Advanced Technologies	1989-90 Budget Estimates (includes special warrants)	Expenditures for the year ending March 31, 1990 (Unaudited)
1.0.1	Minister's Office	\$223,689	\$339,175
1.0.2	Deputy Minister's Office	193,323	196,803
1.0.3	Financial and Administrative Services	1,296,407	1,181,227
1.0.4	Research, Planning and Co-ordination	1,159,216	930,504
1.0.5	Technology Commercialization	1,360,652	1,233,499
1.0.6	Investment Development	353,202	288,971
1.0.7	Corporate and Public Relations	738,105	703,684
1.0.8	Human Resources	95,316	92,575
1.0.9	Premier's Council on S & T	90,000	71,770
	TOTAL	\$5,509,910	\$5,038,208
Vote 2	Financing of Technology and Research Projects		
2.1	Infrastructure Development and Support		
2.1.1	Biotechnology	--	--
2.1.2	Electronics/Microelectronics	\$3,680,000	\$3,680,000
2.1.3	Telecommunications/Information Services	763,050	813,050
2.1.4	Computer and Software	400,000	400,000
2.1.5	Advanced Manufacturing	--	--
2.1.6	Advanced Materials/Processes	1,000,000	1,000,000
2.1.7	Advanced Tech. and Engineering Support	3,310,040	3,310,040
2.1.8	Medical Research Support	370,000	370,000
	Total Sub-Program	\$9,523,090	9,573,090
2.2	Commercialization of Advanced Technologies		
2.2.1	Biotechnology	7,100,000	7,275,000
2.2.2	Electronics/Microelectronics	--	431,584
2.2.3	Telecommunications/Information Services	--	328,520
2.2.4	Computers and Software	3,500,000	3,716,352
2.2.5	Advanced Manufacturing	--	100,725
2.2.6	Advanced Materials/Processes	3,800,000	3,416,356
2.2.7	Emerging Technologies	3,024,000	1,543,098
2.2.8	Medical Innovation	2,333,000	2,333,000
	Total Sub-program	19,757,000	19,144,635
	TOTAL	\$29,280,090	\$28,717,725

Science and Technology Expenditures

The provincial government invests in science and technology that supports its public policy objectives in health improvement, environmental protection, industrial and social development, and the advancement of local scientific competence. Its science agenda is the sum of the programs and budgetary allocations of several departments and agencies. Technology, Research and Telecommunications, in co-operation with Statistics Canada, conducts an annual survey of the government's science activities. This appendix is a brief overview of the results of the 1989-90 survey.

On its own, this survey offers a series of indicators of provincial government expenditures, the allocation of those expenditures, human resources, and provincial priorities/objectives in the scientific arena. These provincial indicators can provide significant input to policy formulation and program evaluation when used in conjunction with the indicators generated from companion surveys (to be published at a later date), in particular those relating to the federal government, the private sector, universities, and private non-profit institutions.

The term "indicator" is used deliberately. Specifically, a number of problems exist with data relating to science activities, including: definitions, year-to-year consistency and measurement. Consequently, the reader should be alerted to an estimated confidence interval of ± 15 per cent. It should also be noted that surveys involving different respondents (ie. funders vs performers) can yield substantially different results. While Technology, Research and Telecommunications and Statistics Canada are working to resolve these limitations, and while the data does offer reasonable order of magnitude estimates, caution is urged in drawing conclusions which exceed the rigor of the data.

For more information, please contact: the Director of Research and Planning, Alberta Technology, Research and Telecommunications, 12th Floor, Pacific Plaza, 10909 Jasper Avenue, Edmonton, Alberta, T5J 3M8, (403) 422-0567.

Objectives of Science Expenditures

Industrial development, health, social development and energy were the main targets of 1989-90 science expenditures. As described in Table 1, activities in fulfillment of these objectives accounted for 70 per cent of the year's science spending.

Furthermore, industrial development, health and energy were the focus of the government's research and development agenda, absorbing 71 per cent of the total R&D expenditures. Related science activities (RSA) accounted for 25 per cent of government spending in these three priority areas.

The priorities of industrial development were manufacturing and agriculture. These two objectives captured 89 per cent of the total expenditures in industrial and economic development. R&D activities were the major components in both of these objectives.

Energy science dollars were directed toward fossil fuel projects. Research and development activities constituted 85 per cent of total expenditures in fossil fuels research and 11 per cent of the year's total science dollars. Expenditures related to health care (\$30.8 million) were predominately financed by the AHFMR.

Under social development, RSA accounted for 96 per cent of the total budget for this objective. The largest sub-component was culture, sport, and recreation which was primarily funded by Culture and Multiculturalism. The other sub-components included education, human resources, and urban and regional studies which together captured 23 per cent of the social development budget.

**Table 1. Objectives of Science Expenditures of the Provincial Government in
1989-90
(\$in '000s)**

<u>Objective</u>	<u>R&D</u>	<u>RSA</u>	<u>TOTAL \$</u>	<u>%</u>
Industrial & economic development	40,079	11,943	52,022	21.0
agriculture	13,482	7,206	20,688	
fisheries	106	210	316	
forestry	1,493	532	2,025	
manufacturing	23,820	1,643	25,463	
other	1,178	2,352	3,530	
Health	36,760	7,362	44,122	17.8
Social development	1,819	41,563	43,382	17.5
culture, sport and recreation	606	23,273	23,879	
education	367	4,465	4,832	
human resources	--	2,673	2,673	
urban and regional studies	--	2,663	2,663	
other	846	8,489	9,335	
Energy and fuels	27,987	5,097	33,084	13.4
conservation	369	--	369	
fossil fuels	26,921	4,851	31,772	
renewable resources	697	--	697	
other	--	246	246	
Environmental issues	5,307	22,540	27,847	11.3
land information systems	655	14,100	14,755	
air	467	827	1,294	
land	1,878	2,078	3,956	
water	676	1,471	2,147	
other	1,631	4,064	5,695	
Transportation	2,129	8,916	11,045	4.5
Advancement of science	8,345	--	8,345	3.4
Wildlife	1,145	1,650	2,795	1.1
Other	24,670	-	24,670	
TOTAL	148,241	99,021	247,262	

Major Funders and Performers

Various departments and agencies shape the government's science agenda as performers and/or funders of research and related activities. Those with science expenditures exceeding \$1 million are listed in Table 2. The year's science agenda was largely the product of TRT, AHFMR and AOSTRA, which collectively accounted for 46 per cent of total expenditures. Note that these three organizations are essentially funders of research that is performed by the university and industry sectors.

Technology, Research and Telecommunications (TRT) was the main financier of manufacturing science and technology development, supplying \$25 million toward that objective. Manufacturing technology development was performed mainly by industry and universities. The other major R&D performer funded by TRT was Alberta Research Council (ARC). ARC received \$25 million in grants and contributions from the department in 1989-90.

The Alberta Heritage Foundation for Medical Research (AHFMR) has been the mainstay of medical research funding since its creation in 1979. Its awards to university scientists in 1989-90 accounted for 58 per cent of university performed research. In relation to the government's objective of health improvement, AHFMR awards constituted 70 per cent of the total health expenditure. Other participants in the health agenda included the Environment Ministry which used \$3.7 million of its science budget for health-related research and Health which contributed \$7 million. TRT, AADAC, and Occupational Health and Safety together contributed \$2.7 million to the provincial health agenda.

The Alberta Oil Sands Technology and Research Agency (AOSTRA), is the major source of government awards and contracts to industry for fossil fuels science and technology. About half of its 1989-90 research budget was delegated to the private sector. Alberta Energy shows a comparable reliance on industry. These two organizations provided \$22.6 million or 43 per cent of the total government science dollars spent in the private sector.

The other departments and agencies listed in Table 2 are essentially performers, consuming two thirds to 95 per cent of their science budgets on intramural activities. In dollars, the largest science establishments within government were: Culture & Multiculturalism; Forestry, Lands & Wildlife; Agriculture; Environmental Centre; and Transportation & Utilities.

In the aggregate, the intramural expenditures of the government absorbed 39 per cent of the year's science budget. Industry was the leading extramural performer, capturing 21 per cent of science expenditures; universities accounted for 19 per cent, while the ARC accounted for 13 per cent.

**Table 2. Major Funders and/or Performers of the 1989-90
Provincial Government Science Agenda
(\$in '000s)**

<u>Department</u>	<u>Intramural</u>	<u>Industry</u>	<u>University</u>	<u>ARC</u>	<u>Other</u>	<u>Total</u>
TRT	495	15,315	8,659	24,570	774	49,813
AOSTRA	4,934	16,775	4,856	4,432	1,229	32,226
AHFMR	1,569	500	26,811	-	1,932	30,812
Culture & Multiculturalism	17,652	-	-	-	5,166	22,818
Forestry, Lands & Wildlife	15,457	4,864	196	621	333	21,471
Agriculture	14,044	867	1,914	-	3,863	20,688
Environmental Centre	10,534	364	44	90	-	11,032
Transportation & Utilities	8,516	460	115	287	575	9,953
Energy	1,019	5,802	484	1,189	219	8,713
Health	2,847	504	1,155	-	2,441	6,947
Solicitor General	1,550	3,490	-	-	-	5,040
Environment	2,118	641	30	287	968	4,044
Municipal Affairs	3,326	575	75	-	64	4,040
Economic Dev. & Trade	2,706	494	5	-	7	3,212
Advanced Education	486	-	1,261	-	900	2,647
Education	1,418	104	260	5	327	2,114
Treasury	1,626	346	-	-	-	1,972
Labour	1,498	115	-	-	-	1,613
Career Dev.. & Employment	1,237	213	7	-	197	1,654
Occup. Health & Safety	755	155	105	-	584	1,599
Tourism	591	630	-	-	75	1,296
Environmental Council	1,043	-	-	-	-	1,043
Other *	1,781	296	320	-	118	2,515
Total	97,202	52,510	46,297	31,481	19,772	247,262

* Other included AADAC, Attorney General, Consumer & Corporate Affairs, ACCESS, Family & Social Services, Recreation & Parks, and Special Waste Management Corporation.

Human Resources

There is a human resources component to the intramural science expenditures. Major employers of science personnel, those departments with 100 or more such employees, are shown in Table 3. As expected, the five departments with the largest in-house science budgets have the largest concentration of scientific talent. In 1989-90, they employed three out of four people in the government's science work force.

Research and development personnel constituted 18 per cent of the government's science professionals, technicians, and auxilliary staff. In-house research and development tends to be concentrated in the natural sciences and engineering fields -- the science capabilities most prominent in environmental and agricultural research. The vast majority (77 per cent) of science employees performed RSA. Their work spanned an array of information services such as technical/statistical surveys, mapping services, feasibility studies, testing and standards calibration. Throughout the 1980s, the government's science work force has engaged predominately in RSA. Staff associated with the administration of external science programs comprised six per cent of the government's science labour force.

**Table 3. Science Personnel Employed by the Provincial Government,
1989-90 (in Person-Years)**

<u>Department or Agency</u>	<u>R&D</u>	<u>RSA</u>	<u>AEP¹</u>	<u>TOTAL</u>
Agriculture	141	272	12	425
Culture and Multiculturalism	-	292	-	292
Environment ²	91	198	7	296
Forestry, Lands & Wildlife	51	243	44	338
Transportation & Utilities	8	146	2	156
Other	56	364	51	471
TOTAL	347	1,515	116	1,978

1. administration of external programs

2. includes the Centre, Department and Council

Comparisons of Annual Expenditures

Scientific expenditures in 1989-90 were \$1.4 million less than in 1988-89, a decrease of slightly over a half per cent. Major declines occurred in the science budgets of AHFMR (\$6.8 million), TRT (\$3.2 million), and Environment (\$2.5 million). These were offset by higher expenditures in the Departments of Energy (\$4.2 million) and Culture and Multiculturalism (\$3.8 million).

Historical revisions to the data resulted in two major changes. First, a change in reporting resulted in an upward adjustment of \$14 million to the science expenditures of Culture and Multiculturalism in 1988/89. Second, re-grouping of the data resulted in the creation of the sub-components "land information systems" under the objective "environmental issues." The dollar value of this new sub-component was \$15.8 million in 1988/89 and \$14.8 million in 1989/90. Other changes to the historical data will be documented in future publications.

Incorporating the changes mentioned above, Table 4 tracks the annual science expenditures of the provincial government during the 1980s.

Table 4. Annual Science Expenditures of the Provincial Government
(\$in 000,000s)

<u>Expenditures</u>	<u>1980-81</u>	<u>1982-83</u>	<u>1984-85</u>	<u>1986-87</u>	<u>1988-89</u>	<u>1989-90</u>
Science	119.9	212.8	276.7	333.4	248.7	247.3